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THE AGRICULTURAL SITUATION FOR 1918

A SERIES OF STATEMENTS PREPARED UNDER THE DIRECTION OF THE SECRETARY OF AGRICULTURE

PART IX

POTATOES

AN AMPLE SUPPLY OF POTATOES NEEDED

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AN AMPLE SUPPLY OF POTATOES NEEDED.

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IMPORTANCE OF THE POTATO.

THE POTATO is a starchy food that performs the same role in the human economy as wheat or rye. In normal times it contributes about 13 per cent of our food materials and serves as bread supplements or substitutes. The potato is a bulky, watery food of great tonnage compared with the bread grains. On this account, and because it has a limited storage or keeping period, it cannot take the place of the bread grains in the world commerce. These facts indicate the important place which this bread grain substitute can occupy in local or intrastate (short haul) tonnage, even though barred from international exchange.

The average area of potatoes in the United States during the five years 1909-1913 was about 600,000 acres more than the average for 1904-1908, and the production increased about 60,000,000 bushels. The average yield per acre was about the same in both five-year periods, in spite of the variations from year to year. During the four years 1914-1917, the average yield per acre ranged from 80.5 to 110.5 bushels per acre, a variation of about 37 per cent.

The potato crop of 1917, which amounted to 442,536,000 bushels, was the largest in the history of the United States; only twice before had the crop exceeded 400,000,000 bushels. The farm value at prices on December 1, 1917, amounted to $543,865,000. The annual average value on December 1 for the five years 1909-1913 was $215,892,000. (Table 1.)

TABLE 1.—*Potatoes: Acreage, production, and farm value for the United States.*

Year.	Acreage.	Average yield per acre	Production.	Average farm price Dec. 1.	Farm value, Dec. 1.	
					Total.	Per acre.
	Acres.	*Bushels.*	*Bushels.*	*Cents.*	*Dollars.*	*Dollars.*
1904-1908 (annual average)	3,082,000	96.0	295,771,000	57.5	170,053,000	55.18
1909-1913 (annual average)	3,677,000	97.0	356,627,000	60.5	215,892,000	58.71
1914	3,711,000	110.5	409,921,000	48.7	199,460,000	53.75
1915	3,734,000	96.3	359,721,000	61.7	221,992,000	59.45
1916	3,565,000	80.5	286,953,000	146.1	419,333,000	117.62
1917 (preliminary)	4,390,000	100.8	442,536,000	122.9	543,865,000	123.70

As an article of food, the potato has an important advantage. It is one of the few food products contributing largely to our diet which can be used directly from the field without the delay and expense incident to more or less elaborate manufacturing processes. This plant places within the reach of the individual possessing even a small area of land the means of contributing directly an important article to his food supply.

The potato can be converted also into a number of non-perishable products of great economic importance. In the northern hemisphere, one of the chief of these has been potato starch, an important food product which can be used as a flour substitute, though its greatest value in normal times is in the textile industry, where it is employed extensively in the sizing of fabrics.

As a crop plant in American agriculture the potato holds various stations according to the region in which it is produced and the dominant type of agriculture in that region. At present the potato ranks sixth among the crop plants of the Nation in the total value of the crop.

Roughly speaking, there are two great commercial potato harvests in the United States—one from the early truck crop of the Southern States and California; the other from the so-called winter or storage crop produced in the Northern States. No other country possesses territorial limits which enable it within 12 months to secure two harvests from a crop plant of such importance as the potato. These two great harvests bear an important agricultural as well as commercial relation one to the other. The early crop of the Southern States is produced largely from seed grown in the Northern States. It is therefore dependent to a marked degree upon the character, quality, price, and abundance of northern-grown seed. The magnitude of the northern-grown crop on hand toward the close of the storage period, its quality, and its price also have a profound economic influence upon the value of the southern harvest, for an abundant supply of good old potatoes from northern storehouses at reasonable prices frequently results in slow demand and low prices for the southern-grown crop. For a brief period during harvest time in years of abundant crops, these two regions are truly competitors instead of supplementary regions, as they are in seasons of normal or sparse yields.

In recent years, since the true relations existing between these great crops have been understood, information has been gathered and placed at the command of the southern planter in ample time each year to enable him to increase or decrease his acreage to meet the needs of the markets as forecasted by the hold-over crop in the hands of producers and dealers in the northern crop. This year there is an unusually large hold-over crop in sight.

Besides the interdependence of the potato crops of the two geographic areas, the entire potato crop of this Nation bears an intimate relation to bread-grain production. The potato fills an important place in the crop rotation of those States lying either north of the corn belt or at altitudes which preclude the ripening of corn. In much of the agricultural area of the United States corn is the great clean-tillage or hoe crop. Where the potato replaces corn, it offers equal advantages in subduing the land through tillage. In this country two crops, corn and potatoes, occupy the place that potatoes occupy in the farming system in Scotland and in Germany.

Throughout the trucking area of the Atlantic and Gulf States, the place of the potato in a farm rotation is less clearly defined, although even here potatoes are seldom followed by potatoes for more than two successive crops, and potatoes do not follow sod, as is almost invariably the case in northern systems of farming. However, toward the northern limits of the trucking regions, in Long Island for instance, it is a prevailing custom to grow potatoes on sod land, preferably clover. In brief, the potato in certain regions has an important place in the system of farming wholly independent of its importance as a commercial crop.

UNCERTAINTY OF SEASONAL CONDITIONS NECESSITATES AN AMPLE ACREAGE.

The total production of potatoes, as of any crop, depends upon two factors, namely, acreage and yield per acre. The acreage in the United States usually changes very little from year to year, a variation of 3¼

TABLE 2.—*Potato acreage in the United States, yield per acre, and total production, 10 years, 1905-1914, expressed in actual quantities and as percentages of the 10-year average.*

[Acreage and total production in thousands; i. e., 000 omitted.]

Year.	Acreage.	Per cent of 10-year average.	Yield per acre.	Per cent of 10-year average.	Production.	Per cent of 10-year average.
	Acres.	*Per cent.*	*Bushels.*	*Per cent*	*Bushels.*	*Per cent*
1905	2,997	86.9	87.0	90.2	260,741	78.1
1906	3,013	87.4	102.2	105.9	308,038	92.3
1907	3,128	90.7	95.4	98.9	298,262	89.3
1908	3,257	94.4	85.7	88.8	278,985	83.6
1909	3,669	106.4	106.1	109.9	389,195	116.6
1910	3,720	107.9	93.8	97.2	349,032	104.5
1911	3,619	104.9	80.9	83.8	292,737	87.7
1912	3,711	107.6	113.4	117.5	420,647	126.0
1913	3,668	106.3	90.4	93.7	331,525	99.3
1914	3,711	107.6	110.5	114.5	409,921	122.8
Average	3,449	....	96.5	....	333,908	.....

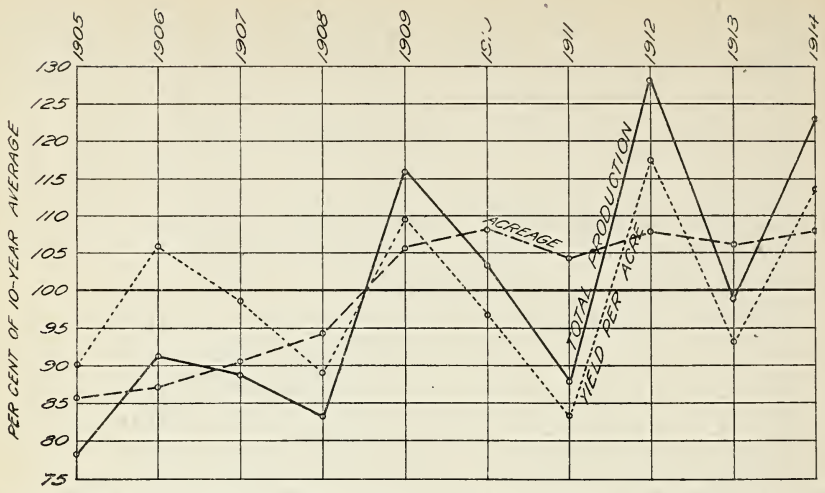

FIG. 1.—Effect of fluctuations in yield per acre upon total production of potatoes in the United States. Acreage, yield per acre, and total production are represented as percentages of the 10-year average, which is taken as 100.

per cent being the average, though in 10 years a decided increase in acreage is observed. This is shown by the accompanying chart (fig. 1), in which the acreage, yield per acre, and total production of potatoes are represented as percentages of the 10-year average (1905-1914), the latter being taken as 100. (See also Table 2.) The yield per acre, on the other hand, fluctuates widely from year to year, the average change being 17.6 per cent. In the yearly fluctuations in total production, which average about 19.9 per cent, the yield per acre is therefore the dominant factor. Various conditions influence the yield per acre, such as weather, diseases, insects, and abundance or scarcity of labor. In order, therefore, to provide annually an ample harvest of potatoes to meet the requirements of our people, the acreage planted should be sufficient so that in years when conditions conspire to reduce the yield per acre the crop will still be adequate to supply the Nation's needs.

MEANS OF ABSORBING THE SURPLUS CROP.

To plant an acreage that will be ample in unfavorable years carries with it the danger of heavy production or over-production in years when conditions are congenial. In such years a bumper crop will result and prices will rule abnormally low. In this country at present provision for absorbing the surplus tonnage of such years is limited practically to the use of the potatoes as feed for hogs and chickens and in the manufacture of starch. In other countries other potato products have been made, with varying degrees of success, such as

potato flakes, made by drying cooked potatoes spread in a thin film on a steam-heated cylinder; schnitzels, which are thin-sliced or shredded potatoes dried in a rotating cylinder by the smoke and flame from a furnace; dried riced or sliced potatoes, cooked before drying; and raw potatoes, shredded, dried, and ground, for use as a substitute for wheat flour. Large quantities of peeled boiled potatoes can be used as a wheat flour substitute in bread making, to the extent of 25 per cent of the flour; and they offer a ready means of conserving the supply of bread grains.

CULTURAL PRACTICES IN DIFFERENT REGIONS.

Owing to the wide diversity of soil, climatic, and seasonal conditions under which the potato is grown in the United States, it is inadvisable, as well as impossible, to suggest a single cultural practice that would be applicable to all sections of the country. Since the crop divides itself naturally into two great divisions, according to the time when it is planted, whether grown as an early truck crop or as a late or main crop, this distinction divides the country into two great sections, the North and the South. For convenience, however, a third division may be made, to include the irrigated sections of the West, which involve somewhat different cultural practices from either of the other two. Potato growing, therefore, may be considered under three heads, viz, (1) potato growing in the South and Southwest, (2) potato growing in the North and West, and (3) potato growing under irrigation.

REGIONAL AND CROP SECTIONS DEFINED.

As an early truck crop the potato is grown chiefly in the South and Southwest. In only a few sections of this territory are second-crop potatoes grown extensively. The area involved in this discussion is that portion of the United States in which the growing season is sufficiently long and the climatic conditions sufficiently favorable to make it possible to grow two crops of potatoes in a season. The area involved under the first division, therefore, would include practically all of the Atlantic Coastal Plain section from Long Island to Florida, and all of the Southwestern States, including southern California, the Louisville district in Kentucky, and such other sections as might be included under the two-crop basis. It must be remembered, of course, that the territory north of the Eastern Shore of Maryland should be considered the twilight zone, as it were, between the first and second-crop divisions. For example, the New Jersey and Long Island crop may be harvested as an early or as a late crop, according to whether market prices are attractive or not.

The area involved in the second division may be said to include all territory not involved in the first division, except the strictly irrigated districts in the arid and semi-arid regions of the West.

The third division includes certain areas in northwestern Nebraska, North and South Dakota, the Greeley, Carbondale, San Luis Valley, and other sections of Colorado, and various portions of Montana, Idaho, Utah, Nevada, Oregon, Washington, and California.

POTATO GROWING IN THE SOUTH AND SOUTHWEST.

As the early potato crop of the South is of vastly greater importance than the late or second crop grown in the same region, much more careful consideration should be given to the selection of a suitable soil.

SOIL TYPES.

As early maturity is a prime consideration, well-drained, warm sandy loam or gravelly soils are especially suited. Heavy or poorly drained land should be avoided. Land with a southeastern or southern exposure is desirable. The land should be relatively free from late spring frosts.

CROP ROTATIONS.

As a result of giving too little attention to crop rotation, many of the soils in the trucking sections of the South are deficient in organic matter, hence have less moisture-holding capacity and it is difficult to keep them in an open, friable condition.

In the Hastings district in Florida, most of the cultivated land produces a crop of potatoes every year. The potato crop is usually followed by a crop of corn. When the corn receives its last cultivation, a crop of cowpeas is usually drilled in. The cowpeas are sometimes plowed under, but more generally they are cut for hay.

In the Norfolk trucking section, no general system of crop rotation is followed, but potato cropping year after year is not commonly practiced. Cowpeas and crimson clover should be more generally grown in this section as cover crops to be turned under.

PREPARING THE LAND.

As the early potato crop in the South is planted for the most part during the winter months, it is customary to plow the land into ridges, or beds, leaving the surface in a rough condition in order to prevent undue compacting of the soil. This insures better drainage and makes it possible to prepare the land for planting at an earlier date than could otherwise be done. Two or three weeks before planting begins, it is customary to mark off rows by throwing two furrows together from opposite directions, making narrow ridges. This ridging further favors the drying out of the soil and, at the same time, exposes a larger surface to the rays of the sun, thereby increasing the amount of heat absorbed. Every aim of the grower should be to get the land in the

most favorable condition for early planting. No attempt is made, as with a late crop, to put the surface soil in a finely pulverized condition at the time of planting, because it has been found that with heavy rains the soil becomes too compact. Dependence is placed on subsequent cultivation, as the ground begins to warm up and dry out, to put the land in the friable condition necessary to a satisfactory root development.

FERTILIZERS.

To supply the plant food necessary to the development of a satisfactory potato crop, the grower may employ either manure or commercial fertilizers, or both. As a rule the former can be obtained only in limited quantities and, except in a few sections favored with water transportation rates, is not relied upon to any extent. In no other section except in northern Maine are commercial fertilizers used as extensively as in the South. The increasing scarcity and high price of potash, together with excessive cost of nitrogen, now lends a new aspect to the problem of supplying available plant food to the potato crop. Farm manures should be conserved on the farm, and wherever it is possible to purchase them at a reasonable price, the grower will find it profitable to use them in connection with commercial fertilizers. Applied at the rate of 10 tons per acre, supplemented by an application of 800 to 1,000 pounds of a fertilizer analyzing 1 to 2 per cent of nitrogen and 8 to 10 per cent of phosphoric acid, it should be possible to produce as good, or better, results than would be obtained from an application of a ton per acre of a fertilizer containing 5 per cent of nitrogen and 10 per cent of phosphoric acid. Where farm manures are not available, the customary practice has been to apply from 1,800 to 2,500 pounds of a commercial fertilizer per acre. Until the potash scarcity made it impossible to secure high-content potash fertilizers, the usual fertilizer purchased contained from 5 to 7 per cent of ammonia, 8 per cent of phosphoric acid, and 8 to 10 per cent of potash. Today, the grower finds it very difficult to obtain a fertilizer containing potash.

HOW APPLIED.

Where potato planters are used, the commercial fertilizers are generally applied in the drill at the time of planting. In sections where hand planting is still in vogue, it is customary to apply a portion of the fertilizer in the drill row a week or so in advance of planting by means of special drill row distributors, the fertilizer being worked into the soil immediately after its application. The rest of the fertilizer is applied and worked in just prior to planting. In other cases, the whole amount is applied just before planting. Occasionally a grower applies a portion of the fertilizer after the crop is planted.

VARIETIES TO PLANT.

In the southern portion of Florida, and in the States of Alabama, Mississippi, Louisiana, Texas, Oklahoma, Arkansas, and a portion of Tennessee, the Triumph is the leading variety grown. In the Hastings district in Florida, Spaulding No. 4 (Rose 4) is grown almost exclusively, while from this point north to Long Island, N. Y., the Irish Cobbler is the leading commercial variety.

TIME OF PLANTING.

In southern Florida, as for example around Miami, potatoes are frequently planted in November. Mostly, however, December and January are the planting dates in Florida. As one goes north along the Atlantic Coastal Plain section, the time of planting is gradually extended. The latter part of February and early March are the dates at which seed for the early crop is put in the ground in the Norfolk section, and the last of March and the first of April, in the New Jersey and Long Island regions. Nearly the same advance in planting dates may be noted in the southwestern section; as, for example, southern Mississippi and Texas, and eastern Oklahoma and Western Arkansas.

SOURCE OF SEED SUPPLY.

A very large portion of the seed used in planting the southern truck crop is grown in the North. This is particularly true with respect to the territory in which the Irish Cobbler and Spaulding No. 4 are grown. One of the principal seed-producing sections in the North is that of Aroostook County in northern Maine. This locality grows large quantities of Irish Cobbler seed potatoes. The output of Spaulding No. 4 is materially smaller, because the demand is infinitely less. Triumphs are furnished in even smaller quantities than Spaulding No. 4. Other sources drawn upon for seed stock by the southern truck growers are Vermont and New York; and the second-crop Cobbler seed produced locally and in the Louisville, Ky., district.

The growers in the Southwest get some of their seed from Maine, but by far the greater part is produced in Wisconsin, Minnesota, Nebraska, and second-crop Triumphs from Oklahoma and Arkansas. The Texas growers prefer the Arkansas and Oklahoma second-crop seed to that of Wisconsin and Minnesota. Their first preference is for seed produced in the region of Alliance and Hemingford, Neb.

GOOD SEED IMPORTANT.

Too little attention heretofore has been given to the importance of planting good seed. If any evidence is needed in support of this statement, it is only necessary to call attention to the nondescript character of much of the seed planted in 1917, and the poor results secured from its use. There was, however, some excuse for using it, as the extreme

scarcity of potatoes of any kind and the relatively small percentage that was really fit for seed made it impossible in many cases to buy good seed at any price.

GOOD SEED DEFINED.

It has been pointed out that good seed is important, but no attempt has been made to define what is meant by good seed. The following definition is hereby presented: "Purity with respect to the variety; produced by healthy, vigorous, heavy-yielding plants; grown under favorable climatic and soil conditions; somewhat immature; reasonably uniform in size and shape; firm and sound, with first sprouts beginning to develop at planting time." Such seed is procurable to a limited extent in several States where seed certification work is being carried on, as, for example, in Maine, Vermont, New York, Wisconsin, and Minnesota.

AMOUNT OF SEED TO PLANT.

The amount of seed that is normally planted in the South for an early crop is in the neighborhood of 600 pounds per acre. While many plantings in 1917 were made with from 360 to 480 pounds, it is considered good practice to use at least 900 pounds per acre where the land is in a good state of fertility and liberal applications of fertilizers are made.

TREATING THE SEED.

The seed potatoes should be treated with formalin or corrosive sublimate solutions before cutting and planting them. The formulas recommended are as follows:

Formalin Treatment.—Add 1 pint formalin to 30 gallons of water. Soak potatoes in this solution 1½ to 2 hours. Remove and dry.

Corrosive Sublimate Treatment.—Dissolve 4 ounces of mercuric chloride[1] (corrosive sublimate) in 30 gallons of water. Soak potatoes in solution 1½ to 2 hours.

CUTTING SEED FOR PLANTING.

Cut the seed in from one to three-eye pieces, depending upon the size of the tuber and the number of eyes. Cut the tuber in such a way as to secure blocky seed pieces, weighing from 1 to 1¼ ounces. It is a good practice to sprinkle the freshly-cut seed with flowers of sulphur, land plaster, or air-slaked lime. This material tends to dry the cut surfaces and lessens danger from heating if the weather is warm and the cut seed is not to be planted immediately. When large quantities

[1] Mercuric chloride dissolves very slowly in cold water, but rather quickly in hot water. It is desirable, therefore, to dissolve the crystals in a small quantity of hot water and then add to it the required volume. Use only wooden vessels. The solution is very poisonous; therefore, care must be exercised in its use if accidents are to be avoided. The solution should not be used oftener than four times.

Care should be exercised to prevent contact of seed after treatment with infected containers of any kind.

are to be planted, and it is necessary to cut in advance of planting, care should be taken to sprinkle the cut surfaces as directed and to spread them out in a frost-free building, in a layer not over a foot in depth, turning them over at least once, and preferably twice, during the first 24 hours, and once a day for the next two or three days, or until the cut surfaces are healed over, when they may be barreled or sacked and stored in a cool place until needed for planting. Unless such precautions are taken it is not desirable to cut seed more than a few hours in advance of its being planted.

RATE OF PLANTING.

Where there is a sufficient amount of plant food in the soil and a reasonable assurance of the necessary moisture, the rows may be spaced from 30 to 34 inches apart and the seed pieces from 10 to 12 inches apart in the row. The closer planting, that is, rows 30 inches apart and plants 10 inches in the row, gives over 21,900 plants per acre, while the wider spacing, 12 by 34 inches, gives 15,379 plants. If seed pieces averaging an ounce in weight are used, it would require nearly 1,370 pounds for the closer spacing, and over 960 pounds for the wider one. The spacing more generally employed is from 32 to 36 inches between rows and from 12 to 14 inches apart in the row.

DEPTH OF PLANTING.

In general, the early crop is planted rather shallow, protection being given to the seed piece by a very heavy ridging of soil over the rows in order to keep out frost and, at the same time, expose a larger surface to the sun's rays.

CULTIVATION.

The object of cultivation is to prevent weed growth, conserve moisture, liberate plant food, aerate the soil, and, by keeping it in a loose, friable condition, encourage root action. The usual practice is to harrow the rows lengthwise before the plants appear with a light spike-tooth harrow. As the plants begin to appear, the teeth should be slanted so as to lessen injury. When the plants are up sufficiently to define the rows, the soil between the rows should be stirred as deeply as possible and as close to the plants as is safe. The next cultivation should be shallower and not so close to the plants. Whether the implement used be a sweep, a shovel-plow, or a cultivator, it should be so adjusted as to throw some soil toward the plants. In fact, in practically the whole southern truck crop section, the ridge system of cultivation is practiced. Subsequent cultivation consists in stirring the sides of the ridge and throwing more soil to the plants.

With the ridge system, cultivation of the crop can be continued later than where level cultivation is practiced, because in the former prac-

tice the roots are confined to the ridges, and the furrow between may be cultivated with more or less impunity, and a slight amount of soil winged toward the plants. In level cultivation the roots soon spread all through the ground between the rows. Under this system, cultivation should be discontinued shortly after the tubers begin to develop. The aim should be to give as thorough tillage as possible in the early development of the crop, so as to afford the most favorable conditions for the completion of the growth of plants and tubers.

HARVESTING.

The early crop usually is harvested long before it is mature. This statement is particularly true with respect to the territory south of Norfolk. The degree of immaturity at which the crop is harvested is largely dependent on the condition of the market. If prices are high they serve as a strong incentive to the grower to dig, even if the yield is materially less. This is especially true when there is a likelihood of large shipments later from points farther north. To a certain extent, therefore, each section, from the extreme South to the northern limit of the early crop, must harvest and market its crop in advance of that of the next section north, if undue competition is to be avoided. The only exception to such a practice is when there is a marked scarcity of old potatoes in the market and the early crop is none too large. Such a condition existed in 1917, and many growers, taking advantage of it, allowed their potatoes to remain in the ground until they had made a maximum crop.

METHOD OF HARVESTING POTATOES.

Among the implements used for harvesting the potato crop of the South are hand diggers, one or two-horse turning plows, and two to four-horse elevator diggers. Hand digging is not practiced as extensively as plowing the potatoes out with an ordinary turning plow.

The use of the elevator digger is on the increase, and with continued scarcity and consequent high price of labor, it probably will come into still greater favor.

Hand digging is sometimes necessary in order to avoid causing too great an injury to the intercrop which has been planted with the potatoes.

When plowed out, some of the tubers are buried and it becomes necessary to go over the rows by hand and remove them from the loose earth. This operation is called "grabbling" in the South, and is mostly done by women and children who throw the tubers from adjoining rows into small piles which are later gathered into barrels, crates, or sacks.

In most sections the potatoes are graded into No. 1's and No. 2's as gathered.

In the Hastings and Indian River Farms districts in Florida, a considerable portion of the crop is gathered into crates and hauled direct to a mechanical sizer, either on the farm or at a central station, which divides the tubers into three sizes.

PACKAGES, OR CONTAINERS.

The barrel is the container universally employed in all the Atlantic Coast States, north of Ft. Pierce, Fla. South of that point, and on the west coast of Florida, the 50-pound splint basket hamper is used. Throughout Alabama, Mississippi, Louisiana, Texas, Oklahoma, and Arkansas, the 90-pound sack is the common container.

LATE-CROP AND SECOND-CROP PRODUCTION IN THE SOUTH.

The production of a late crop or second crop of potatoes involves two distinct sources of seed supply. The term "late" is used in this connection to designate a crop from either northern or home-grown seed of the previous season, held over in cold storage for the planting of a late crop, which in many instances is planted on the same ground as that on which the early crop had been grown.

The term "second crop" is used here to designate a crop which has been grown from seed produced by the first crop; in other words, seed of the current season's growth. According to this definition second-crop potato production is not practiced to any extent outside of Florida and the Southwestern States. Oklahoma, Arkansas, and Texas are the heaviest producing second-crop States, while the Eastern Shore of Virginia and Maryland, and the New Jersey, Delaware, Long Island, N. Y., and Louisville, Ky., districts represent the heaviest producing late-crop sections.

Seed for late crop.—As has been stated, late-crop seed may be either northern-grown or home-grown, but in either case it is seed of the previous season's growth. If northern-grown seed is used, it must be held in cold storage after it begins to warm up in the spring. Home-grown seed from the late crop may be held in common storage until planted and, in fact, generally is, but it is not considered a good practice to do so.

Seed from first crop.—There are several methods of handling seed from the first crop for the planting of the second. One method is to plant back the culls of the newly dug crop in freshly opened furrows and allow them to go through their resting period in the soil. Usually, they remain dormant from four to six weeks and, as a rule, germination is uneven and very often there is a poor stand.

Another method is to open a trench and fill it to a depth of 4 to 6 inches with the cull potatoes intended for seed, then cover with the plow by throwing a couple of furrows of soil over them. A week or so before the date for planting, the trench is opened and such tubers

as show signs of germination are selected for use as seed and the others discarded. When planted, such seed germinates quickly and gives a good stand of plants.

A third method is to spread the seed tubers in a thin layer on the ground under a tree or building, and leave them exposed to light and air for a month or so. Some growers prefer covering the tubers lightly with straw to prevent too great a loss of moisture.

The first method mentioned is the poorest and should not be practiced. The second method probably is the best.

The practice of planting the culls from the first crop should be discouraged on the ground that it is not possible to produce as large a crop from the small cull tubers as from medium-sized ones.

Varieties grown for late, or second crop.—In Florida and most parts of the Southwest, the Triumph is most generally grown. In the Louisville, Ky., section, Irish Cobblers, and in the Norfolk and Eastern Shore of Virginia and Maryland sections, the McCormick and Irish Cobbler varieties are the leading ones. In New Jersey and Long Island, Green Mountains and Irish Cobblers are grown, while in some sections of Delaware a red-skinned variety belonging to the Early Rose group seems to be a favorite. The McCormick is also grown as a late crop in Tennessee, Georgia, and other points, under the name of the Lookout Mountain.

Date of planting.—Beginning with the Eastern Shore of Maryland and Virginia, planting usually begins the latter part of June or early in July. In the Norfolk section, it may be delayed until after August 1, and in Oklahoma, Arkansas, and Texas planting may be as late as the last of August, or early September. Briefly stated, it might be said that the planting season of the late or second crop of potatoes extends from June 20 to September 20, depending on the section of country in which they are grown.

Preparing the land.—The preparation of the land, as a rule, involves much less work than for the early crop, because in a great many cases the second crop is planted on first-crop land and usually in the same rows, in order to use up whatever remaining fertilizer there may be.

Fertilizers.—Little, if any, additional fertilizer is applied to the second crop, unless it is planted on land which has no residual fertilizer to draw upon, in which case an application of from 800 to 1,000 pounds per acre might be made.

Planting.—All practices relating to the treatment and cutting of the seed are identical with those for the early crop, but in the case of the late crop planting conditions are somewhat different. Instead of the ground being cold and usually more or less subject to heavy rains, as is the case early in the season, it is usually hot and dry and it becomes necessary therefore to plant the seed pieces from 4 to 5 inches deep, and

to practice more or less level cultivation, in order to conserve the moisture and keep the soil around the newly forming tubers cool. In all other respects cultivation should be similar.

Harvesting:—Generally at the North, harvesting is delayed as long as is considered safe from freezing, which would be early in November in the vicinity of Washington. In the extreme South, however, where late planting is practiced, and where heavy frosts and freezing are seldom encountered, the crop may be left in the ground until late December or January, or even later. When this practice is followed, the crop is usually marketed as a new crop in competition with new crop potatoes from Bermuda and the Isle of Pines. In the northern portion of the Southern district, or that north of Norfolk, the crop remaining after sufficient seed has been saved is stored in cheap storage houses and sold in competition with northern-grown table stock.

POTATO GROWING IN THE NORTH AND WEST.

The late or main crop of potatoes, which constitutes about 85 per cent of the total crop of the United States, is largely produced in Maine, New York, Pennsylvania, Michigan, Wisconsin, and Minnesota. In 1917, the production of these six States was over one-third of that of all of the other States combined, and nearly one-half that from the total area included in this discussion.

The chief points of difference between the North and the South with regard to potato growing is that in the North but one crop can be grown during the season, and that in many localities the whole of the growing season must be utilized in the making of the crop.

SOIL TYPES.

The soils best adapted to potato culture in the North and West are very similar to those recommended for the South, except that the lighter and warmer soils are not of such prime importance for a late crop as for an early one. Generally speaking, sandy or gravelly loam soils are preferred, if well drained and fertile, but clay loam soils are not undesirable and may be made to produce an abundant crop of tubers if the proper cultural conditions obtain.

CROP ROTATION.

The crop rotations of the North and West, though somewhat variable, are nevertheless more or less definite. For example, in the northeastern part of the United States, the common rotation is a three- to four- or five-year rotation in which the potato alternates with grains or corn and grass. Usually a grass or clover sod is plowed under, as such a preparatory crop is regarded as highly desirable. Where alfalfa can be grown, it is preferable to use it rather than clover, as the crop to precede potatoes in the rotation system. Some growers prefer to plant corn on the sod land and let the potato crop follow the corn.

PREPARING THE LAND.

Where the land is not subject to washing during the winter season, it is usually preferable to plow clover sod in the fall. However, some good growers prefer to plow their sod land for potatoes in the spring. If the land is inclined to heaviness, fall plowing will help materially to improve its physical condition through the action of frost, sun and wind, snow, and rain.

DEPTH TO PLOW.

It is desirable to plow the land as deep as it will stand. This may be anywhere from 6 to 10 inches, depending on the character of the soil. If the top soil is deep and fertile, it should be plowed 10 inches or more, but if it is shallow and underlain with a cold and stiff subsoil, it is not advisable to turn up more than an inch of this subsoil at any one plowing. In the case of fall plowing, the land should be left as plowed, but where spring plowing is practiced, the newly-plowed land should be disked the same day, in order to conserve the moisture and prevent the newly-turned-over soil from baking and getting cloddy. Too little attention is paid to this phase of the preparation of the land for a crop.

FITTING THE LAND.

No reasonable effort should be spared to put the land in the best physical condition possible before planting the crop. It is much easier to prepare the land before the crop is planted than it is afterward, and weeds are less likely to give trouble.

FERTILIZERS.

As yet, the use of commercial fertilizers is confined very largely to the northeastern portion of the United States—Maine being one of the heaviest users. Michigan, Wisconsin, Iowa, and Minnesota growers use fertilizers sparingly or not at all, and those west of Minnesota do not use them at all.

The potato grower of Aroostook County, Maine, uses commercial fertilizers in as large quantities as the truck grower of the South. Applications of 2,000 to 2,500 pounds of a high-grade fertilizer are not at all uncommon; in fact, few make a practice of using less than 1,800 pounds per acre.

HOW APPLIED.

A very large percentage of the growers apply the whole amount in one application at the time of planting the crop. This is readily accomplished by means of the fertilizer distributing attachment with which all potato planters used in the Aroostook County section are equipped. A few growers prefer to apply a part of the fertilizer, usually more than one-half, at planting time, the balance being distributed along each side of the row, about the time the stems are breaking

through the ground. When this is done, it is immediately worked into the soil, or is covered up by the horseshoe as more soil is being winged over the plants.

VARIETIES TO PLANT.

Strictly speaking, but two late main-crop varieties are grown extensively in the northeastern section, including Michigan, Wisconsin, Iowa, and Minnesota. These are the Green Mountain and the Rural.

Many varieties, of course, are represented in each of these main group varieties. For example, we have the Norcross, Gold Coin, Snow, Green Mountain, Jr., Delaware, and others represented by the Green Mountain; and the Rural New Yorker No. 2, Sir Walter Raleigh, Carman No. 3, Nox-All, No. 9, Prosperity, and many others of the Rural group.

In the early class, which are grown more or less for seed purposes, the leading variety in importance is the Irish Cobbler, followed by Early Ohio Triumph, Spaulding No. 4, Early Rose, etc. North of the Ohio River, and throughout Ohio in general, as well as in North and South Dakota, Nebraska, Kansas, and other sections, the Early Ohio is the favorite early variety.

Varieties of the Burbank group, such as the Burbank and Netted Gem, are grown most extensively in Colorado, Idaho, and the West. The Pearl is grown to some extent in Wisconsin for seed purposes, and in Colorado as a commercial variety.

SOURCE OF SEED.

In most of the sections under discussion it is possible to produce home-grown seed, provided sufficient attention is given to the production of good seed. But there is very little necessity for one State to be dependent upon another for its seed supply. It is well, however, to bear in mind that the Northern States, that is, those which lie along the Canadian border, enjoy, as a rule, a much more favorable climate for the production of high-grade seed potatoes than do those to the south of them.

TREATMENT OF SEED.

It is just as important to disinfect seed in the North as in the South, and as the same treatment is given the reader is referred to the instructions given under the discussion of potato growing in the South.

CUTTING SEED AND SIZE OF SEED PIECE.

See discussion, pages 11 and 12.

DATE OF PLANTING.

No general date can be given as the proper one on which to begin planting in the North and West. The locality, the season, and the variety to be grown, are the great determining factors. Early varie-

ties, when intended for early market or for home use, are usually planted as early as the climatic and soil conditions will permit. This date may be the latter part of March or early April in the Kaw Valley in Kansas, or the Great American Bottoms near St. Louis, or it may be the last of April or early May in some of the New England States.

When early varieties are planted for seed production, planting is usually delayed until the latter part of May or early June. With the late potatoes, such as the Green Mountain and Rural class, planting will vary from early May until the latter part of June. The earliness or lateness of planting the main crop of potatoes is not governed so much by the length of the growing season as by the character of the season. For example, it has been found in Western New York, Michigan, and Wisconsin that better results on the average are secured from relatively late planting; that is, from June 1 to 20, rather than from May 1 to 20, or even earlier. The reason for this is that the weather during the latter part of July and throughout the greater portion of August is usually hot and dry and if late potatoes are planted early the tuber crop is, or should be, developing during this particular period. Under these conditions it will not make a satisfactory yield. On the other hand, if planted late, tuber development is delayed until September and October, thus coming during a cooler portion of the season and at a time when rains are more likely to be ample for the needs of the crop.

It is extremely desirable, therefore, to study the seasonal and climatic conditions which are likely to occur in any given locality.

TYPES OF PLANTERS.

Two quite distinct types of horse-driven potato planters are in use at the present time. One is known as the picker type, by which the seed pieces are automatically picked up by a series of forks attached to a revolving vertical disk; as each of these pickers reaches a certain point, the seed piece is tripped off and falls into the dropping tube. This machine is known as the one-man planter, because only one man is required to operate it. The regularity and accuracy of its work are largely dependent upon the uniformity of size and of shape of the seed pieces, and the success of each picker on the disk in spearing a seed piece as it revolves through the hopper containing the cut seed.

The second type of planter, while constructed to drop the seed pieces automatically, also makes provision for correcting any failures on the part of the automatic device, by having a second man placed at the rear of the machine to correct such errors as may be made. The automatic device, for distributing the seed pieces, consists of a horizontally revolving disk moving over a plane surface. The seed pieces are distributed automatically one at a time in these pockets, and as

each piece is whirled by the disk over the delivery tube it drops down and is covered. The duty of the second man is to correct such errors as are made by the machine, such as an empty pocket or two or more seed pieces in one pocket, in which case he places a seed piece in the one and removes the extra seed pieces from the other. The advantage of the two-man planter is that it is possible to get practically a 100 per cent perfect planting, while in the case of the one-man planter the imperfections of the planting may be anywhere from 5 per cent to 15 or more, depending, as has been said, upon the uniformity of shape and size of the seed pieces. The disadvantages of the two-man planter are the extra cost of a man and a smaller acreage planted. For example, a two-man planter will average from 3½ to 4 acres per day, while a one-man planter may plant 5 acres. Notwithstanding these disadvantages, the two-man planter is to be preferred, especially if a maximum crop is desired.

PLANTING.

Practically every commercial grower of the North and West uses a potato planter, because it reduces the labor item to the minimum and makes it possible to drop the seed pieces at regular intervals and at a uniform depth, and, what is of still greater importance, places the seed pieces in contact with moist soil.

RATE OF PLANTING.

The rate of planting, or the distance between the rows, is much the same as in some sections of the South, but not in all. In Aroostook County, Me., the early varieties usually are planted in rows from 32 to 34 inches apart, and 8 to 12 inches between plants in the row.

Late varieties, belonging for the most part to the Green Mountain group, are spaced usually 34 to 36 inches apart and from 10 to 14 inches in the row. In Michigan and Wisconsin, it is not at all uncommon to find fields planted in rows 36 inches apart and plants in the row from 24 to 36 inches apart. When so spaced they check-row both ways and can be cultivated in both directions, thus enabling the grower to care for the crop with the least expenditure of effort. It is not possible, however, under such a system of planting, to secure a maximum yield per acre. In other sections of the country included under the present heading, where the annual precipitation is low or the soil is deficient in plant food, the rows are spaced from 42 to 48 inches apart, with plants from 30 to 36 inches apart in the row.

DEPTH OF PLANTING.

Where the ridge system of planting is practiced, it is customary to plant much shallower than where level culture is followed. A depth of 2 to 3 inches is about the average for ridge culture and 4 to 5 where level culture is practiced.

SYSTEMS OF CULTURE.

As has been stated, there are two general or main methods of culture of the potato in the territory under discussion, viz, the "ridge" and the "level" culture systems. The former is probably seen at its best in northern Maine. It is also much in vogue in western New York. The adoption of one or the other system is to a large extent determined by the character of the season under which the crop is to be grown.

Where the weather as a rule is cool during the summer season, and is accompanied by an ample rainfall, the ridge system seems to have some added advantages over the level culture method, because cultivation can be continued later in the season without injury to the roots of the plants, and should the weather be rainy during the harvesting period the ridged soil will dry out more quickly and can be handled more easily in the digger than when level culture is practiced. On the other hand, it is just as apparent that where periods of heat and drought are likely to occur during the summer season the level culture is to be preferred.

CULTIVATION OF THE CROP.

The cultivation of the crop really begins with the preparation of the seedbed. If the seedbed has been poorly prepared, no amount of subsequent preparation will overcome this handicap entirely. It is a good plan to begin cultivating the crop as soon after planting as may be necessary to maintain an earth mulch. This cultivation may be given with a spike-tooth harrow or a weeder, preferably the former if it is one in which the teeth can be slanted as desired. This form of cultivation may be continued without material injury to the plants until they are well above ground. After this the space between the rows should be stirred as deeply as possible with a two-horse cultivator, going as close to the plants as is possible without too much injury to the developing rootlets. The second cultivation should be shallower than the first and not so close to the plants, subsequent cultivations being governed largely by the character of the soil, the nature of the weather, and the system of cultivation practiced. Every effort should be made to keep down weeds and conserve the moisture by maintaining an earth mulch. With the ridge system of culture, the roots of the plants are practically confined to the ridged-up soil, making it possible to continue stirring the soil in the center of the row and to throw some of it toward each ridge, after level culture would have to be discontinued. In level culture a slight amount of soil should be thrown toward the plants with each of the last two cultivations. This is done in order to protect the developing tubers from exposure to light and to frost.

HARVESTING THE CROP.

The potato harvesting season in the North and West begins with the digging of the Early Ohio variety in the Kaw Valley, Kans., and the Great American Bottoms, during the latter part of July, and winds up in New York, Michigan, Wisconsin, and other points the latter part of October or early November.

Except where a relatively small acreage is grown, the crop is harvested with the elevator type of potato digger. In sections where the soil is relatively light and the ridge system is practiced, the digger is operated with two horses, but in many other sections three or four horses are necessary.

In Maine, the crop is hauled from the field to the storage house or shipping point in barrels. The barrels are simply used as receptacles in which to transport the crop from the field and are not used as storage or shipping containers. In other portions of New England, the crop is generally hauled from the field in crates, or sacks, or in bulk. In Western New York and Wisconsin, crates are generally used, while in Minnesota and the States west of that point the 2-bushel sack is commonly used.

Shipments from Maine points are made either in bulk or in 11-peck sacks. New York and Michigan ship in bulk or in 2½-bushel sacks. Minnesota and all western points ship potatoes in the 2-bushel sack.

STORAGE.

Storage is an important matter in all late or main-crop potato-producing sections of the United States, because it is necessary to hold a considerable proportion of the crop in order to insure its uniform movement and consumption throughout the winter. Various types of storage may be employed, such as pitting, cheaply or substantially constructed dug-outs, or cellar-pit storage houses, with roofs covered with straw and earth, such as are found in the arid or semi-arid regions of the West. A similar type of storage cellar with a watertight roof is very generally used in the middle West, and in portions of the East.

The Maine potato grower uses a more expensive type of storage house, invariably involving a superstructure which is used for the storage of farm implements and supplies, while the basement is used for the potato.

STORAGE REQUIREMENTS.

The following requirements for storage are deemed essential to the holding of the potato crop with as little loss from shrinkage as possible:

(1) The tubers must be protected from frost. A temperature of from 35 to 40° F. is considered satisfactory.

(2) They must have sufficient ventilation to allow the escape of excess moisture.

(3) They must be kept in the dark if the quality of the tuber is to be preserved.

(4) They should be dry and reasonably free from dirt when put into storage.

(5) All diseased, badly cut, or bruised tubers should be removed from the crop before storing it.

(6) Potatoes should be stored so that they are not more than 6 feet deep in the bin or heap, and the dimensions of the bin should not be greater than 12 by 12 feet, unless ventilation shafts are inserted at suitable intervals when the potatoes are being put into the bin. Ventilated division walls also are desirable. (See Farmers' Bulletin 847.)

If the above requirements are observed, the storage shrinkage on the crop should not exceed 5 per cent, whereas under present home storage and commercial practices it may reach as high as 20 per cent.

POTATO GROWING UNDER IRRIGATION IN THE WEST.

In the arid and semiarid regions of the West potatoes as a rule can not be grown successfully without the artificial application of water to the land on which they are planted. The method of handling the crop, aside from the cultural requirements necessary to the application of water, does not differ materially from that which obtains in the humid regions of the North and West.

In addition to this, some differences may be noted with regard to the system of crop rotation that is practiced. In the discussion that follows, therefore, only such variations from the cultural practices in the North and West will be mentioned.

CROP ROTATION.

In the irrigated regions of the West, the alfalfa crop is the one which is practically relied upon to maintain the fertility of the soil. The usual practice is to follow potatoes with wheat, oats, or barley, seeded back to alfalfa. In some cases, two successive crops of potatoes are removed from the land before seeding it to grain and alfalfa. This land is supposed to remain in alfalfa from three to five years or longer before being again devoted to a potato crop.

PREPARING ALFALFA LAND FOR A POTATO CROP.

The common practice pursued in the preparation of alfalfa land for a potato crop is to crown the land in the late summer or early autumn. This operation consists in plowing the land from 4 to 5 inches deep. This is done to destroy the alfalfa crowns, and if the work is done thoroughly, it will lessen very materially the cost of caring for the crop the ensuing year. Usually the last cutting of alfalfa is turned under when the land is crowned, thus increasing the amount of humus. The destruction of the alfalfa crowns is much more rapid and complete if the newly-crowned land is disked occasionally throughout the autumn. In the spring the land is plowed as

deeply as the character of the soil will permit, say 9 to 10 inches. The newly-turned land should be disked in order to conserve the moisture and prevent the formation of clods. The disking should be continued until planting time in order to create a suitable seedbed.

A second method of preparing alfalfa land is to defer plowing it until late in the spring, when a heavy growth of alfalfa can be turned under. Such a method does away with crowning, as the land is plowed to the full depth at the first operation and immediately prepared for the crop.

FERTILIZERS.

So far as known, commercial fertilizers are not used in the production of potatoes on the irrigated lands of the West. The only fertilizers applied to the land are farm manures. These, coupled with the fertility made available by the alfalfa crop during its occupancy of the land, are sufficient to produce a good crop.

RATE OF PLANTING.

On irrigated land a somewhat wider spacing is necessary in order to permit of ridging the land and at the same time provide a furrow for the flow of the irrigation water. The rows usually are spaced from 36 to 38 inches apart, with the plants 10 to 14 inches apart in the row.

SIZE OF SEED PIECE.

Generally speaking, it is desirable to use a larger-sized seed piece on irrigated than on unirrigated land, because, being assured of an ample supply of moisture, it is possible to develop a larger number of tubers of marketable size than where moisture is lacking. Instead, therefore, of planting 600 to 900 pounds of seed, 1,200 to 1,500 may be very profitably used.

APPLICATION OF WATER.

No hard and fast rules governing the application of water to the soil can be laid down. Seasonal variations in rainfall and snowfall necessitate modifications in time and frequency of applying water. A good general rule is to apply water whenever the moisture content of the soil is below the actual requirements of the plants. If the soil is deficient in moisture before planting time, it is preferable to apply water prior to fitting the land rather than after it is planted. Should climatic conditions be such after planting as to remove so large an amount of moisture from the soil as to delay or even prevent germination, one should not hesitate to irrigate. Such an application of water is usually referred to as "irrigating up." Some growers make a practice of withholding water from the field until the tubers are set on the plants. While this may be a desirable practice when the soil has a reasonably good supply of moisture, it is not good practice if,

through adherence to it, the growth of the plants has been arrested. It is believed that better results, on the average, will be secured when the crop is irrigated as its need of moisture is apparent. In some seasons, two or three irrigations may be sufficient; in other seasons, three times that number may be required. It is not a good plan to overirrigate, and it is equally undesirable to underirrigate. Frequent light irrigations are no more to be recommended than infrequent heavy ones. A careful irrigator will strike a happy mean.

The quality of a potato crop is largely dependent on the skill of the irrigator, or the avarice of the grower. To insure a high-quality tuber, water should be withheld from the crop from four to six weeks before harvesting begins. This insures a thorough ripening of the tubers and a cleaner product, as they come out of the ground much freer from soil than when irrigation is continued too late to permit of the tubers ripening. Such portions of the crop as may be desired for seed purposes should be harvested early in order to insure their immaturity.

Where a large yield, rather than high quality, is the sole aim of the grower, irrigation is continued till almost the close of the growing season.

CULTIVATION.

The cultivation of the crop does not materially differ from that described for the North and West, except in this respect—that good tillage is all the more essential under irrigation because the application of water in the furrows between the rows has a tendency to puddle the surface soil and thus make cultivation necessary.

The main thing to keep in mind is that the early cultivations should be deep and thorough, and that the rows should be so ridged as to form a broad ridge with a deep, narrow furrow, rather than a narrow ridge and a broad, rather shallow furrow. The aim of the grower should be to apply water to the plants in such a way as to have the flow of water come in contact with a minimum amount of surface soil. A heavy flow of water is not as desirable as a medium one. Neither is it desirable to have the water level in the irrigation furrows, when applying water, above the level of the developing tubers. The aim should be to have the upper layers of soil secure their moisture by capillary attraction rather than by actual contact with the water.

HARVESTING THE CROP.

The method of harvesting the crop does not differ from that previously described for the North and West, except that somewhat heavier diggers have to be used on lands that are prone to bake. Four horses are always required to haul the digger, and under exceptional conditions six are sometimes needed. The crop throughout all the irrigated districts is handled in 2-bushel sacks.

POTATO DISEASES.

Broadly considered, potato diseases are a menace to the industry because they increase the cost of production and injure the quality. There are 12 or 15 potato diseases of major importance, not to mention the few score minor weakling parasites, pseudo parasites, and physiological maladies, with which the crop must contend. Nearly all of the more serious of these diseases are tuber-borne, and several of them are capable of infecting the soil more or less permanently. Since the potato ordinarily is propagated vegetatively from buds developing in the tubers, all the individual plants of a given variety, strictly speaking, are to be regarded as parts of the original plant of that variety, and the opportunity of eliminating disease by sexual regeneration, possessed by plants propagated from seed, is largely lost. Moreover, great areas of production are located in southern regions, where the crop can be maintained profitably only by the annual importation of seed tubers from the North. There is also a very general practice among all growers of occasionally importing fresh seed stock or exchanging seed with a neighbor, frequently to the detriment of one or both. In this way both the native and the introduced diseases have been repeatedly carried into all centers of production and permanently established wherever environmental conditions permit.

Among the important foliage diseases of the potato are early blight *(Alternaria solani),* late blight *(Phytophthora infestans),* and physiological trouble known as tip-burn.

Early blight appears first as an angular leaf-spot which kills the tissue as it enlarges, developing characteristic target-board markings. It does not cause a decay of tubers, but in sections where it becomes severe it greatly reduces the yield.

Tip-burn is a physiological trouble resulting in dead leaf tips, sometimes involving a large portion of the leaf area. It is due to inadequate supply of water to the leaves from the roots.

Late blight is one of the oldest and most destructive of all the potato diseases. Fortunately it is unable to develop at high temperatures or in a dry atmosphere, so that it is limited to the cooler and more humid centers of production. The first centers of infection originate from seed tubers decaying with the fungus. Cool, moist weather favors its spread, but hot or dry conditions check it effectively. In bad years the disease is capable of frightful destruction. Entire fields of most promising appearance have often been totally destroyed by it in a very few days when spraying with Bordeaux mixture was not employed against it. The fungus may also infect the tubers and cause a storage rot of very destructive character.

Mosaic is another important disease which under northern conditions is manifested by mottled green foliage. In severe cases serious dwarfing of the plant occurs. Under other environmental conditions the mottled leaf symptom is suppressed more or less completely, but the evil effect on the yield of the plant remains. The disease is transmitted through the tubers, but it does not change their appearance. It causes an average reduction in yield of at least 30 per cent. The cause is unknown, but the indications are that the disease is infectious.

Several distinct and important diseases of the stems, which also involve the root system and tubers, may be mentioned together for the sake of brevity. They are (1) black leg, (2) southern bacterial wilt, (3) Verticillium wilt, (4) Fusarium diseases, (5) Rhizoctonia diseases, and (6) mechanical injury. Each of these possesses its own distinctive signs, but all produce rolling of the leaves and except where they cause early death there is a stage in their development when they produce similar pictures.

Black leg is a bacterial disease, entirely seed-borne and evidently of northern origin. Typically it kills the plants early with a characteristic black stem rot. The plants which survive and produce tubers are the only means known by which the disease is carried and perpetuated. There is no evidence that it survives in the soil.

Southern bacterial wilt is confined to the South and is far more serious in new or virgin soils.

Verticillium and Fusarium.—Verticillium disease has been found on the potato only in our northern sections, while the more common Fusarium, of which several species are parasitic on the potato, is prevalent in all the potato sections of the United States. These organisms invade the roots and stems, particularly the vascular portions, and cause a long series of distress symptoms culminating in extreme cases in wilt. The fungi pass into the tubers also, where they often produce discoloration in the vascular portion. Under certain conditions they cause destructive decay of potatoes in the ground or in storage. These fungi are soil inhabitants, so that the infection in a crop may originate either in the seed employed or in the soil in which it is growing.

Rhizoctonia is not a vascular parasite but attacks the stem from without. It acts as a damping off agent on young shoots, and on the older stems, roots, and stolons it forms cankers which often penetrate so deeply as to impair the vascular tissue, particularly the phloem elements which function in the transport of elaborated food. Aerial tubers and little potatoes are among the common results. The sclerotia of this fungus constitute the black scurf frequently met with

on tubers even when there is no evidence of parasitism. The causal fungus is a widely distributed soil inhabitant.

Mechanical injury, such as cultivator wounds, wind whipping, and stems broken from other causes, produce appearances much like Rhizoctonia.

Leaf roll is a disease of unknown and perhaps physiological cause with which the above described diseases have frequently been confused. This disease is best recognized by the more or less spoon-shaped rolling and leathery texture of the leaves, particularly the lower ones, to which it frequently is confined. The plants are likely to be smaller than normal and of yellowish green, sometimes taking on various other discolorations which vary with the variety. The yield is greatly reduced, often only equal to the seed planted. The disease is transmitted in the seed and some believe it to be infectious, though conclusive experimental proof of this is lacking.

Common scab is so familiar as to call for no description. It is caused by a soil-inhabiting organism akin to the bacteria. Soil conditions exercise a profound influence upon its parasitic activity. Planting scabby seed on some soils always results in scabby stock, while in other soils the progeny is clean. Some soils give clean stock when treated or scab-free seed is used and scabby stock when scabby seed is used. Some soils give progeny covered with scab when clean treated seed is used even if potatoes are being grown on them for the first time.

Powdery scab is a recently introduced disease somewhat resembling common scab in appearance. When first discovered in America it aroused grave concern, but experiments have given reassuring results. The trouble seems to be strictly confined by natural agencies to certain heavy types of soil in the more northern districts, and even there it ordinarily is of little consequence.

CONTROL MEASURES.

The principal control measures available to all farmers for use against potato diseases are plant selection in the seed plot, tuber selection in the bin, seed treatment, field spraying, and prevention through soil sanitation and modification of cultural practices.

Plant selection in the seed plot aims at the elimination from the grower's seed stock of the progeny of all plants that are weak or diseased from any cause. Each year a sufficiently large area is set aside for the grower's own seed production. It is planted with the best stock obtainable, is properly but not excessively fertilized, and special care is bestowed upon it. All objectionable plants, with their tubers, if any have formed, are removed from time to time as the

indications of weakness or disease appear. At digging time further selection may be employed to remove the progeny of hills having normal tops but giving undesirable or unsatisfactory returns.

Seed plot selection is directed against those tuber-borne diseases which cannot be detected by inspection of the seed stock, but at the same time it is effective in such troubles as black leg and wilt, and it is a very efficient means of removing varietal mixtures and the poor-yielding, though not necessarily diseased, hills. It cannot be depended upon to restore productivity quickly in stock containing a high proportion of degenerate or run-out hills. A new start with vigorous stock is the only practical course in such cases.

Tuber selection in the bin is best carried out at the time of cutting. It removes tubers showing decay, serious mechanical injury and necrosis, either external or internal, and is aimed primarily against the wilt diseases, net necrosis, black leg, and other decay-producing diseases from those constitutional weaknesses frequently developing from the use of partially decayed or seriously injured seed. It is not a satisfactory substitute for the seed plot selection but supplements it to good advantage.

Seed treatment is employed to destroy (1) the sclerotia of Rhizoctonia or black scurf, (2) the scab-producing organism present in common scab spots, and (3) surface infection with the black leg organisms which may have resulted from contact with tubers decaying from this cause. It is also of value in destroying the germs of some other minor diseases on the surface of seed potatoes. Seed treatment does not reach black leg or other types of infection within the tuber and of course has no effect on Rhizoctonia or scab organisms in the soil. Two solutions are in common use. The one most generally recommended contains 4 ounces of corrosive sublimate (bichloride of mercury) dissolved in 30 gallons of water. The other contains 1 pint of formalin (40 per cent formaldehyde) in 30 gallons of water. In either case the treatment consists in immersing potatoes in the solution for an hour and a half to two hours either at planting time or at any convenient earlier date. Corrosive sublimate dissolves with difficulty in cold water, amalgamates with metals, is a deadly poison when taken internally, and deteriorates with use. It must therefore be handled with great care, used in wood or cement containers, and renewed frequently. Sacks employed as dipping containers use up the chemical more rapidly than crates. The formalin solution is cheaper than corrosive sublimate, easier to make up, does not change strength on using, nor does it grow weaker on standing as is frequently stated, but it is less efficient and seems sometimes to injure the seed slightly, though usually this is not the case.

Spraying when properly done controls both the early blight and the late blight. By far the best mixture for this purpose thus far devised

is properly prepared and properly applied home-made Bordeaux mixture.[1] Intelligently and effectively used, it is capable of controlling almost completely the most serious outbreaks of late blight, with a large margin of profit. As to the advisability of its use against early blight, local conditions must determine. The mixture has at least minor value as a plant stimulant, acts as a protective covering, and exerts a mildly repellent action against such insects as flea-beetles.

The essential requirements regarding the sprayer are that it should have a pump which delivers the mixture under a constant pressure of from 120 to 200 pounds and that it should be equipped with an adequate number of nozzles of a type that will throw the spray in a fine mist in sufficient quantity and with sufficient force to cover all parts of the plant.

Soil sanitation measures, such as crop rotation and the removal of infection-bearing material, tiling for drainage and aeration, and various other means of influencing the biological processes of the soil are the means resorted to for removing disease germs from soil in which they have become established.

Modified cultural practice is one of the means by which the soil-inhabiting parasitic organisms and such troubles as malnutrition, tip-burn, and various other physiological disorders are dealt with. Obviously the special modification advisable in any case depends upon the trouble and the specific condition; for example, tip-burn results from the inability of the root system to supply an adequate quantity of water to the tips of the leaves. Frequently this is the result of shallow rooting, which in turn may follow from too hard a subsoil, too shallow plowing, a layer of dry soil at the bottom of the furrow, concentration of plant food at the surface, and so on. The remedial practice must aim at removing the cause or so improving the conditions that the natural strength and vigor of the plant will carry it through. Disregard of soil sanitation and careless cultural practices account for a very large proportion of the unprofitable crops of potatoes produced every year in the United States.

POTATO INSECTS.

COLORADO POTATO BEETLE.

Injury by the Colorado potato beetle and its "slugs" or young is known practically throughout the entire United States, from the Great Plains eastward to the Atlantic coast, except a few counties in the extreme southern portion of the Gulf region. It has appeared recently as a pest in Washington and Oregon. This insect is a hard-

[1] The preparation of Bordeaux mixture is described in Farmers' Bulletin 868, How to Increase the Potato Crop by Spraying.

shelled, stout beetle, of a distinct yellow color, about three-eighths of an inch long. Its wing-covers are ornamented with 10 longitudinal black lines. The young or "slugs" are dark-red when hatched, becoming paler as they grow older. They are slimy and soft in texture and disgusting in appearance.

In its extreme northern range this potato beetle produces only one generation or brood, but farther south, two or three generations occur. The winter is passed in the beetle stage, underground. The beetles appear in early spring and continue until the cold weather of September or October, according to locality. One female can produce 1,800 and 1,900 eggs. The possible progeny of two or three broods is enormous. In 1916 it is estimated that at least 20 per cent of the potato crop suffered from its ravages. During 1917, for no reason which can be assigned, the insect was conspicuous by its absence, but in another year or two it may be as troublesome as ever. It is certain to appear locally in numbers.

The best remedies are arsenicals, and of these arsenate of lead is in many respects preferable to Paris green, which it is rapidly replacing. The high price of all copper compounds incident to the war has resulted in an increase in the price of Paris green, while lead arsenate, although it also has increased in price, is somewhat cheaper.

Lead arsenate does not kill as quickly as Paris green, but insects cease feeding as soon as they receive a poisonous dose. It is sold in both powdered form and paste form, and is used at the rate of 2 pounds powder to 50 gallons of water, or Bordeaux mixture, or in paste at double this strength. In small gardens two-thirds of an ounce or 1 level teaspoonful to a gallon of water is in the same proportion. For the paste form 1 1-3 ounces or 3 level teaspoonfuls are used to a gallon of water.

For the proper application of this spray a sprayer of the best type and approved nozzles should be employed. A single application when the slugs first appear will kill most of them, but a second or third dose may sometimes be required. Later on other broods must be treated in the same manner.

Other remedies, such as jarring beetles and "slugs" early in the season by brushing them from the plants into large shallow milk pans containing a thin scum of kerosene, and hand-picking, are of value early in the season, but are too laborious for a large acreage.

BLISTER-BEETLES.

Blister-beetles are slender, somewhat soft-bodied insects of various colors, from ash-gray to jet black, and some of the common forms are yellow ornamented with longitudinal black lines. These also are well known to most potato growers and are called in some sections "old-fashioned potato bugs." They show a preference for potatoes, but

attack various other truck crops as well, such as beans and beets.

Lead arsenate is the best remedy, prepared and supplied as directed for the potato beetle, but in some portions of the country, especially in the Middle West, driving the beetles into windrows of rubbish such as brush and dried weeds, and burning them, is useful.

FLEA-BEETLES.

When potato leaves are found to be pitted with minute holes it is evidence that flea-beetles are at work. The potato flea-beetle, a minute flea-like insect, is known to most potato growers of the North. Southward and westward other species have the same habit and the methods of control are the same for all.

When Bordeaux mixture is used for potato diseases it serves to prevent disease and also to drive away the flea-beetles, though it is difficult to kill them. Lead arsenate when applied for insects has some killing power against the flea-beetles, but it acts chiefly as a deterrent. In some regions the young plants, which are most subject to injury, are kept covered with air-slaked lime or even finely powdered road dust, and afterward the insecticide or fungicide is applied. A combination of both is often useful. Weeds of the potato family must be kept down throughout the season.

POTATO TUBER MOTH.

In California the caterpillar or "worm" of a small gray moth is the worst insect enemy of potatoes and related plants. In other States it occurs more sparingly, for example, in Texas and in Florida, and injures tomato and eggplant. From its injury to tobacco it has been called also the "splitworm." This species injures the potato by destroying the leaves and tunneling into the tubers in the field. It continues work on the tubers in store. It occurs the year round.

Good farming is the best means of control, including care that no tubers are left where the insect can work on them. Potatoes should be harvested and marketed as rapidly as possible, unless the grower has storage facilities and can fumigate them, if necessary, with carbon disulphid, using 2 or 3 pounds to 1,000 cubic feet of air space (measured before storing the tubers) and leaving two or three days before disturbing. Uninfested tubers should be kept where the moths cannot lay eggs on them, never being left in the ground after they are ripe. Placing infested potatoes in cold storage at about 40° F. is useful. This method is adopted temporarily in holding potatoes for a rise in price where they will not deteriorate in value.

WHITE GRUBS.

White grubs or "grubworms" are the larvæ or young of the brown May and June beetles familiar to most farmers. They live on tubers and roots under ground and are very serious enemies to the potato.

Deep plowing is the most effective remedy and cross plowing and deep disking are frequently necessary. The ground should be disturbed often and kept clear of weeds so that the grubs can be eliminated, practically by starvation for lack of their natural food supply.

The planting of potatoes year after year on the same ground must be avoided where these pests are abundant. Beets, sweet corn, strawberries, grasses, and weeds harbor white grubs. Fertilizers applied as a heavy top dressing are beneficial, as is also gas lime.

Hogs turned in, as soon as the crop is off, on land on which potatoes have been severely injured by white grubs, will devour large numbers of them. Domestic fowls are useful to pick up grubs on newly plowed land.

Alternate crops which will not be attacked by white grubs are difficult to find. Clover of all kinds, alfalfa, and buckwheat are not much injured by white grubs, and this is true of some of the minor truck crops, such as asparagus, beans, peas, and cowpeas, as well as cole crops (such as mustard, spinach, tomatoes) and cucurbits (squash, pumpkin, and melons).

WIREWORMS.

Wireworms differ from white grubs in being elongate and wiry. They are the offspring of snapping beetles or "snap-bugs." Frequently they do great injury to the tubers and roots under ground, and are even more difficult to control than white grubs. The remedies are practically the same. The farmer should exercise considerable care in the selection of land for planting and also for crop rotation.

PLANT-LICE OR "APHIS."

During cool and moist springs outbreaks of plant-lice or "aphis" are apt to occur. An unusually severe outbreak of the potato aphis and the spinach aphis, minute creatures of louse-like appearance, occurred in 1917.

The potato aphis may be pink or green in color, and frequently individuals of both colors appear on the same plant. It is about one-eighth of an inch in length, with unusually long legs and feelers. The spinach aphis is smaller. Its wingless forms are nearly always yellowish green, and the back of the winged form between the wings is green and black spotted. The potato aphis is nearly confined to potato, tomato, and related plants, but occasionally attacks other crops such as sweet potato. The spinach aphis is commonly found on spinach, to which it is a serious menace, but it is a "general feeder," attacking truck crops of all kinds.

Both these forms subsist by sucking the vital juices of plants, and are found usually on the underside of the leaves, where they gather

in large colonies, and frequently at the tips of the stems. Sometimes they appear to cover all parts of the plant.

These and similar pests can positively *not* be destroyed by arsenical poison. Contact insecticides are the best, and of these nicotine sulphate in dilute solution is more satisfactory than any other. The formula for large quantities follows:

Nicotine sulphate (40 per cent)	⅜ pint.
Soap, laundry or fish-oil	2 pounds.
Water	50 gallons.

For use in small quantities:

Nicotine sulphate (40 per cent)	1 teaspoonful.
Soap, laundry	1 1-inch cube.
Water	1 gallon.

Such combinations are used as a fine spray at high pressure so as actually to hit the "lice" and kill them. On well-developed plants between 100 and 150 gallons of this spray are required to the acre. Every effort should be made to cover all parts of a plant and wet them thoroughly.

In case of light attack hand-spraying is sometimes all that is necessary. Careful inspection should be made when insects of this nature are suspected. Spray as soon as possible after they are observed. Most efficient work can be done *early in the season* on small plants, and it is good practice to keep the plants always free from these pests.

LEAFHOPPERS, PLANT-BUGS, AND OTHER SUCKING INSECTS.

Leafhoppers sometimes are very injurious to potatoes. The bean leafhopper, a small green insect, has been described as one of our worst all-around leafhopper pests. It has been destructive in recent years. The remedies advised for the plant-lice on potato are useful in combating leafhoppers. A capturing device called a "hopperette" or hopperdozer is also useful where leafhoppers do most extensive damage. Small forms of plant-bugs and leaf-bugs also are destructive at times, and can be controlled by nicotine sulphate, but the larger plant-bugs are difficult to control.

GRADING AND MARKETING POTATOES.

PREPARATION FOR MARKET.

Probably no other perishable crop receives such rough handling as the Irish potato. From the time the grower starts digging until the potatoes are in the consumers' hands they are handled very much as though they were stones or coal. As a result a large loss occurs from cut, bruised, and decayed stock. To avoid this loss the grower should

exercise care in digging and handling, so that the fork, plow, or digger may do only a minimum amount of mechanical damage, and, in picking up, hauling to storage, and packing, the workers should not throw the tubers into the receptacles.

Some of the handling would be eliminated if the culls were left on the ground at harvesting time. A few growers aim to do the grading and sizing as the potatoes are picked off the ground. This sometimes is unsatisfactory because of the class of labor generally used, but growers should make greater efforts to have the defective stock left out. Grading and sizing is best accomplished by specially trained labor either at some central place in the field or at the warehouse. More time and closer supervision can be given to the grading work when this is done in warehouses or cellar storages. Machine sizers have proven almost indispensable where large lots are handled. Machines for sizing are more accurate, give more uniform results, require less labor, and are more economical than hand labor. However, it has been noted that far too many of the growers and shippers depend upon the machine to grade for quality as well as for size. Defective stock must be picked out by hand, as no machine will do this work. With the aid of modern machinery the growers and shippers should have little trouble in grading all of their potatoes into the standard grades.

RECOMMENDED GRADES.[1]

The Department of Agriculture and the Food Administration jointly have recommended and urge the adoption and use of the following grades, which, in their opinion, will meet the needs of the Federal Reserve Board, in connection with the United States warehouse act, as well as those of growers, dealers, and consumers.

U. S. Grade No. 1.

This grade shall consist of sound potatoes of similar varietal characteristics, which are practically free[a] from dirt or other foreign matter, frost injury, sunburn, second growth, cuts, scab, blight, dry rot, and damage caused by disease, insects, or mechanical means. The minimum diameter[b] of potatoes of the round varieties shall be one and seven-eighths (1⅞) inches, and of potatoes of the long varieties one and three-fourths (1¾) inches. In order to allow for variations incident to commercial grading and handling, 5 per centum by weight of any lot may be under the prescribed size, and, in addition, 3 per centum by weight of any such lot may be below the remaining requirements of this grade.

U. S. Grade No. 2.

This grade shall consist of potatoes of similar varietal characteristics, which are practically free[a] from frost injury and decay, and which are free from serious damage[c] caused by dirt or other foreign matter, sunburn, second growth,

[1] Doc. Markets No. 7. This document may be obtained from the Chief of the Bureau of Markets, U. S. Department of Agriculture.

cuts, scab, blight, dry rot, or other disease, insects, or mechanical means. The minimum diameter shall be one and one-half (1½) inches. In order to allow for variations incident to commercial grading and handling, 5 per centum by weight of any lot may be under the prescribed size, and, in addition, 5 per centum by weight of any such lot may be below the remaining requirements of this grade.

Explanations of Grade Requirements.

[a] "Practically free" means that the appearance shall not be injured to an extent readily apparent upon casual examination, and that any damage from the causes mentioned can be removed by the ordinary processes of paring without appreciable increase in waste over that which would occur if the potato were perfect. Loss of the outer skin (epidermis) only shall not be considered as an injury to the appearance.

[b] "Diameter" means the greatest dimension at right angles to the longitudinal axis.

[c] "Free from serious damage" means that the appearance shall not be injured to the extent of more than 20 per centum of the surface, and that any damage from the causes mentioned can be removed by the ordinary processes of paring without increase in waste of more than 10 per centum by weight over that which would occur if the potato were perfect.

PACKAGES.

There is a great need for packages in which potatoes may be shipped with less damage in transit, as well as packages which are more uniform as to capacity. At present we find in use the cloth-top barrel, veneer barrel, basket barrel, and double-headed barrel, many different sizes of sacks, and a few hampers, lug boxes, and crates. No standard container for the shipment of potatoes has been established by law, but the Federal standard barrel act fixes the capacity of the barrel commonly used for potatoes. Many of the veneer barrels now used in Virginia, and in North and South Carolina, are so frail that large numbers are broken or crushed in transit and much loss is incurred.

LOADING CARS.

Much care is necessary to load cars safely.[1] Double-headed barrels of potatoes should be loaded on their sides, across the car; they should be loaded tightly, and well "chocked" or braced in the center of the car. Cloth-topped barrels always should be loaded on end, with the tops up, never on their sides. If the second tier is not filled, the last row across the car on each side of the doors should be laid down with the bottoms toward the end of the car, in order to brace the standing barrels and make the load more secure. Hampers containing potatoes should be loaded alternately, the first one top down, the adjoining one bottom down, and so on, but never on their sides, as the weight of the

[1] More, C. T., and Dorland, C. R., Commercial Handling, Grading and Marketing of Potatoes. U. S. Dept. of Agriculture, Farmers' Bulletin 753.

upper tiers and the jolting of the cars are very likely to cause the lower baskets to be crushed and to lose their covers.

Early potatoes in sacks are loaded on end, and spaces or aisles should be left between the rows of sacks from end to end of the car to allow ventilation. Another tier may be loaded on end, or the sacks may be laid flat one or two layers deep.

Late potatoes may be loaded in the same manner, but heavier, or all of the sacks may be laid flat, either crosswise or lengthwise in the car.

When potatoes are shipped during cold weather, proper care must be taken to protect them from freezing. Plenty of straw on the floor along the sides, especially around the doors and against the ends, helps to protect them. Artificial heat is necessary in the coldest weather when shipping from northern sections.

Sometimes it is not possible for shippers in some sections to secure refrigerator or heater cars to fill their orders. Where this is the case they must resort to box cars. These must be lined with paper, a false floor built in, then studding placed around the inner sides and covered with lining of boards, which should be covered with another layer of paper. There must be a free circulation of air between the floor and sides of the car and the false floor and lining that is built in.

IMPORTANCE OF ADEQUATE STORAGE.[2]

During the past season, owing to early freezing weather and the shortage of cars, the necessity and value of adequate storage facilities on the farm especially, and also at shipping stations, was emphasized. Since it was impossible either to sell or to transport to market the entire crop at digging time, storage facilities on the farms and at loading stations for one-half or more of the late crop were absolutely essential to conserve the crop and to furnish consumers during the winter and spring months. Storage on the farm is necessary, because many farmers have not the time or teams to haul to a loading station during the rush of the usual short-digging season, but during the following months they can haul to better advantage. Storage is needed on the farm in order that the farmer may properly care for his seed stock and in order that frosted potatoes may be held till the frost damage develops, and then properly sorted. It is needed in order that as much of the crop as possible may be properly sized and graded on the farm. While more dealers' warehouses or track storages are needed, the fact remains that only a comparatively small part of the entire commercial crop is held in their storage, and that the great reservoir or surplus supply must be on the farm. Far more and better equipped and protected farm storage facilities are urged.

2 Potato Storage and Storage Houses. Farmers' Bulletin 847. William Stuart.

Track warehouses or dealers' storages are very important, especially during periods when growers cannot haul from the farm on account of bad roads or freezing weather. Such storages also make it possible to secure a greater degree of efficiency in grading potatoes.

MARKETING.

Potatoes are a bulky and usually a comparatively cheap food product. *Market* demands as to quality are not exacting, but it is a fact that the markets desire mostly potatoes of good average size which are bright, smooth, and sound. *Consumers* are interested in securing potatoes which may be prepared for the table with a minimum of waste. *Wholesalers, retailers,* and *consumers* do not desire cull potatoes, and the consumption of good potatoes would be increased if this cull stock were kept off the market. On the other hand, the growers should not be compelled to throw away any potatoes which are desirable as food. There are classes of trade in every market which want only potatoes of the highest grade and are willing to pay an adequate price. Others prefer to buy lower grade stock at lower prices. Neither class of trade is satisfied if the first and second grade stock is mixed together in different proportions. Therefore, the first and second grade stock should be separated to satisfy the different demands. Another very important reason why the potatoes of first and second grade should be separated is in order that a proper sale value can be determined. Some investigations in New York City during the 1917 season showed that different lots of potatoes examined, all supposedly No. 1 grade, contained from 52 per cent to 98 per cent No. 1 stock. The practice of shipping ungraded potatoes invites deception, and stable market conditions should not be expected while poorly graded stock is on the market.

Many growers, shippers, and dealers long have recognized the value of grading, but keen and often unfair competition, as well as the lack of uniform standards to which to conform, has resulted in little if any progress in this direction. Since the Department of Agriculture and the Food Administration jointly recommended grades, very rapid progress has been made. Representatives of both of these Government Departments have spent considerable time in the producing sections enlisting the cooperation of all parties concerned and educating them as to the grade requirements. Strong shipping associations have been organized in practically all of the principal producing States, and the United States potato grades were adopted both by State potato growers' associations and by these shippers associations, to be used as a standard for grading and marketing. As a consequence potatoes are being better graded and are quoted by grade in many of the different shipping sections and central markets. It is believed that market-

ing by grade and quoting uniformly by the hundred pounds will do much to stabilize the potato market and increase the consumption of this product.

MARKET INSPECTION SERVICE.

The 65th Congress enacted a law "enabling the Secretary of Agriculture to investigate and certify to shippers the condition as to soundness of fruits, vegetables, and other food products when received at the important central markets." Inspectors have been placed in many of the principal markets, and beneficial results have already been noted. The service will be extended rapidly to cover all of the principal markets. This is a service which has long been demanded by all honest growers, shippers, and dealers. It should prevent the large number of unjustified rejections, furnish a basis for settling trade disputes, and help to correct many other bad trade practices. The certificates issued by the Department's inspectors concerning the condition of any products are prima facie evidence in all courts.

PURCHASE BY CONSUMERS.

When the potatoes are passing through the usual retail channels the large production may not be reflected in the retail prices. Frequently, on this account, it is difficult for growers and wholesalers to move these abnormally large crops. Retailers have it in their power greatly to increase the sale of potatoes through "special sales" at which potatoes are advertised and sold in quantities, at prices materially lower than usual. It is a very common practice among retailers of the Western States to advertise these sales for certain days of the week. The consumer should be impressed with the fact that he can secure potatoes in this way at unusual prices. Especially at harvest time should the consumer store away enough for winter use, providing he has adequate safe storage space. Also by demanding graded potatoes the consumer can be more certain of the quality he will receive, avoid obtaining very large and very small and defective, wasteful tubers in the same lot, and encourage growers and dealers to ship and sell better graded potatoes.